

**TRANSACTIONS OF SOCIETY OF ACTUARIES
1978 REPORTS**

**REPORT OF THE COMMITTEE ON AVIATION
AND HAZARDOUS SPORTS**

HAZARDOUS SPORTS

THE assembly and tabulation of statistics on hazardous sports has been undertaken by the Committee because of the growing popularity of such activities. The lack of any systematic tabulation by private or governmental agencies, such as that which exists for aviation, makes it very difficult to compile statistics in a form useful for interpreting mortality risk. This report updates data shown in the *1976 Reports* from sources outside the insurance industry and is based on new and, in some cases, more reliable or complete data.

Intercompany hazardous sports insurance data, compiled on a biennial basis, were insufficient again to show any significant results. Only eight companies submitted data for issues of 1972 and later for experience in calendar years 1976 and 1977. Ten companies contributed to the first study. We urge that additional companies contribute their data to future studies.

HAZARDOUS SPORTS IN THE UNITED STATES

This report provides statistics gathered by a continuous survey of several sports and occupations. Evaluation of the hazards of each sport and comparisons of such hazards are left to the reader. Detailed data by age, sex, and frequency were unavailable in most cases. In some cases, the estimates of the number of participants may include persons with very limited activity or persons who have discontinued activity. On the other hand, the fatalities are often understated because there are generally no formal procedures for reporting and recording deaths (unlike fatalities from most aviation activities, which are accurately reported by the National Transportation Safety Board).

For most sports, the numbers participating are available for only one period, although fatality figures may be available for several years. Certain sports, such as baseball, softball, hunting, and horseback riding are excluded because of the small degree of hazard indicated by relatively few deaths or an extremely large number of participants. Figures are given for football, however, to illustrate this type of hazard. Despite a sizable number of deaths in this sport, especially at the high school level, the overall fatality rate is low because of the tremendous number of participants.

From time to time, some ingenious sportsman devises either a new activity based on an existing sport or a totally new sport. Careful attention should be given to such events. The introduction of the moped (motorized bicycle) has been such an innovation. Although speeds normally do not exceed 30 miles per hour, a version of the moped has appeared as a racing vehicle. The new sport is too recent to provide statistics. However, no fatalities have been reported.

Sources and Reliability

The following sources in the United States were consulted: federal and state official government reports; local, regional, and national clubs and organizations; amateur and professional participants; general and specialized magazines and newspapers; specialized casualty insurance companies; certain universities; journalists and writers; books; and general and specialized employees of some of the aforementioned.

The reliability of these statistics ranges from rough estimates to official numbers. Examples of these two extremes are (1) the estimated number of motorcycle jumpers from a knowledgeable active performer and promoter, based on personal experience and observation, and (2) the number of fatalities from hot-air ballooning in 1978, based on legally required reports of the National Transportation Safety Board.

Some of the sources quoted above made use of newspaper clipping services and special surveys. In some cases federal government figures were based on samples of the records on hand.

Aerial Acrobatics

Aerial acrobatics comprise such pursuits as balancing, juggling, tumbling, trapeze swinging, wire hanging, tightrope walking or riding, etc., that are executed above the ground. At the beginning of 1979 there were an estimated 360 professional aerialists. From 1976 to 1978 there was one death, which occurred in 1978.

Air Show Racing and Acrobatics

This is a revision of the sections *Air Racing*, *In-Flight Acrobatics*, and *Stunt or Daredevil Flying* shown in the last report.

Closed-course air racing (racing around pylons) and drag racing engaged about 300 pilots during 1978. As point-to-point air racing is not particularly different from ordinary pleasure flying, statistics for such racing are not included in this report.

During 1978 there were about 600 competitive acrobatic pilots who were qualified to perform formal textbook maneuvers. Such pilots usually perform at air shows for which the FAA gives permission for

flying below 1,500 feet. Noncompetitive acrobatic flying may be practiced by any pilot, provided such practice does not take place below 1,500 feet or over populated areas. Because such flying is actually part of ordinary pleasure flying, statistics are not included in this report.

Air-show flying is basically stunt flying. During 1978 there were about 150 pilots engaged in such activities. The fatality experience among all such pilots has been as follows:

Year	Deaths
1971.....	11
1972.....	2
1973.....	3
1974.....	3
1975.....	1
1976.....	9
1977.....	5

There were also two copilot deaths, one in 1974 and one in 1976.

Amateur/Home-built Aircraft Flying

The number of pilots who fly amateur/home-built aircraft may be estimated from the number of such legally registered aircraft. In 1978, 7,756 such aircraft were registered. However, somewhat less than half of these were active (at least one hour flown in the last 12 months). It has been estimated that there is about a one-to-one correspondence between pilots and aircraft. The fatality experience among pilots has been as follows:

Year	Deaths
1975.....	23
1976.....	41

One student pilot died in 1976. The last report omitted one copilot death in each of the years 1973 and 1974.

Most of the aircraft are fixed-wing, but smaller numbers of rotary-wing aircraft are also in use.

Bicycle Racing

There were 9,800 registered bicycle racers in 1978. In the 1970-78 period there were three fatalities.

Bobsledding

In 1978 there were about 200 competitive racers and about 250 recreational users of bobsleds. No deaths were recorded from 1970 to 1978.

Boxing

There were about 5,500 professional boxers in the United States during 1978. Fatality experience from one source includes amateur and professional boxers, both foreign and American, as follows:

Year	Deaths
1975.....	5
1976.....	7
1977.....	3
1978.....	9

It is estimated that about 40 percent of all fatalities occurred among American boxers in American rings.

Football

Table 1 shows the fatality experience in football playing.

TABLE 1
FOOTBALL DEATHS BY TYPE

YEAR	TYPE			
	Sandlot	Pro and Semipro	High School	College
1976.....	3	0	15	0
1977.....	1	0	8	1
Estimated Minimum Number of Players				
1978.....	1,000,000	1,500	1,000,000	40,000

Glider Flying

Glider may be used for business, pleasure, or training. Table 2 shows the experience for all glider flying.

One student pilot was killed in 1975. Pilot fatalities shown in the last report were combined with crewman and passenger fatalities. Pilot fatalities are now shown separately, as follows:

Year	Deaths
1970.....	7
1971.....	10
1972.....	6
1973.....	6
1974.....	4

TABLE 2
GLIDER FLYING PILOTS, HOURS, AND FATALITIES

Year	Number of FAA Certified Glider Pilots	Hours of Flight (All Purposes)	Pilot Fatalities
1975.....	15,962	203,200	7
1976.....	16,866	245,755	8
1977.....	17,933	350,000	7

The fatality experience among pilots flying aircraft with gliders in tow is given below:

Year	Deaths
1972.....	0
1973.....	2
1974.....	2
1975.....	0
1976.....	1
1977.....	0

Hang Gliding

Estimates of the number of people who used a hang glider at least once during 1978 range from 20,000 to 60,000. The number of fatalities shown in the last report represented the world-wide total for 1976. The fatalities for the United States in 1976, as well as in 1977 and 1978, are included in the figures that follow:

Year	Deaths
1976.....	38
1977.....	18
1978.....	26

It is very likely that deaths for 1977 and 1978 are significantly understated. The recent introduction of emergency parachutes for hang glider pilots may help to improve future fatality experience.

Ice Yachting

This section is a continuation of *Iceboating* shown in the last report. Ice yachts are capable of reaching speeds in excess of 100 miles per hour. During the 1978-79 winter season there were between 5,000 and 6,000 ice yachting participants. Very roughly, between 500 and 1,000 of these participants competed in at least one racing event. From 1970 to 1978 there have been two deaths, neither of which occurred during a race.

Lighter-than-Air Flying

This is an update and revision of the section *Hot-Air Ballooning* shown in the last report. Lighter-than-air flying may employ hot-air balloons, gas balloons, or blimps for pleasure, business, or training flights. Table 3 shows the experience for balloon flying.

TABLE 3
BALLOON FLYING PILOTS, HOURS, AND FATALITIES

Year	Number of FAA Certificated Lighter-than-Air Active Pilot Certificates*	Balloon Hours of Flight	Fatalities (Pilots, Passengers, and Crew)
1970	2,047	6,702	3
1971	2,004	8,100	0
1972	1,970	10,800	0
1973	2,942	13,800	1
1974	3,187	16,425	8
1975	3,132	49,700	1
1976	2,974	31,270	6
1977	3,059	50,000	2

* Each year's figure includes 20 blimp pilots.

Included in the above figures were 3 fatalities in 1970 and 2 fatalities in 1974 that occurred during attempted crossings of the Atlantic Ocean in gas balloons.

Motor Vehicle Racing

The estimated number of racers during 1978, according to type of racing, is approximately the same as shown in the last report. The following is a very incomplete list of fatalities:

Type of Racing	Deaths
1977	
Figure 8 stock	1 (heart attack)
Modified stock	2
Street stock	1 (heart attack)
Sportsman stock	1
Sprint	3
Formula super vee	1
Midget	1
Snowmobile	2
Roadster sports car	1

Type of Racing	Deaths
1978	
Super stock	1
Sprint	3
Late model sportsman stock . . .	3 (1 heart attack)
Late model stock	1
Formula I	1
Top fuel eliminator dragster . .	1
Formula Ford	1
Snowmobile	3

Some fatalities occurred in the pits during official races; one pitman was killed in 1977, and a promoter and a pitman were killed in 1978.

Fatality data for desert racing were not shown in the last report but have now become available. About 3,000 racers participated in automobile off-road desert racing in 1978. This sport has been relatively active for about six years with about one death per year.

Mountaineering

In 1978 there were between 3,000 and 10,000 highly competent and active mountaineers. The total number of mountaineers was about 60,000. The reported fatality experience has been as follows:

Year	Deaths
1975	19
1976	53

In Canada, there were two deaths from mountaineering in 1975 and three in 1976.

Power-Boat Racing

In 1977 the largest power-boat racing association listed the number of members engaged in various types of boating as follows:

Type	Number
Cruiser	47
Drag	83
Inboard	1,377
Inboard endurance	84
Modified outboard	154
Offshore	499
Outboard performance craft	716
Professional racing outboard	416
Stock outboard	1,136
Unlimited	33
Total	<u>4,545</u>

These numbers represent 65 to 70 percent of all racers; most of the remaining racers are of the outboard type. The total number of deaths shown in the last report was grossly understated. During 1977 there were seven deaths. The average, however, has been about five deaths per year.

There are special racing events in which jet and cruiser diesel craft are used. The former can reach speeds of 285 miles per hour while the latter can reach speeds of 65 miles per hour. All other craft reach speeds that range from 30 to 166 miles per hour.

Precision and Stunt Driving

In 1978 there were about 100 automobile precision drivers. Automobile stunt driving also includes about 100 performers categorized as the "top" professionals. There were 10 "top" motorcycle jumpers with about 50 others. Fatalities do occur but they are quite infrequent. One death among motorcycle jumpers was reported in 1974.

Professional Stunting

During 1978 there were about 500 men and women engaged as professional stunt people and employed, in most cases, by the motion-picture industry. From 1975 to 1978 there were four deaths. One of the deaths occurred in an aircraft crash in 1978. In 1975 an aerial stunt man was killed when he fell from an aircraft at an air show.

Rodeo

Rodeo encompasses bareback bronc riding, calf roping, saddle bronc riding, steer wrestling, bull riding, team roping, and steer roping. Although not formally part of pure rodeo, clowning, trick riding, and wild horse racing are also included. In 1978 there were about 4,200 professional rodeo cowboys, 100 clowns, 50 to 100 trick riders, and 30,000 amateur rodeo cowboys. Approximately one death per year occurs among professionals. Amateurs have a safer record.

Scuba Diving

During 1978 a minimum of 300,000 people made at least one dive each. Fatalities among recreational divers are listed below:

Year	Deaths
1975.....	131
1976.....	147

Ski Racing

There were about 80,000 amateur and 800 professional down-hill ski racers in 1978. Speeds can reach over 100 miles per hour. Fatalities average about two per year.

Sport Parachuting

There were between 20,000 and 25,000 sport parachutists who made one or more jumps in 1978. The mortality experience is shown below:

Year	Deaths
1976.....	54
1977.....	49

All figures shown above and in the last report exclude deaths that occurred among parachutists in aircraft that crashed just before the scheduled jump. Table 4 shows this experience.

In 1972 an aircraft being used for a demonstration parachute jump at an air show crashed, killing the pilot and 4 passengers.

TABLE 4
PILOT AND PARACHUTIST
PASSENGER FATALITIES

Year	Pilot Deaths	Parachutist Passenger Deaths
1971.....	0	0
1972.....	0	0
1973.....	2	0
1974.....	1	2
1975.....	0	3
1976.....	1	2
1977.....	3	8

Thoroughbred Horse Racing

There were about 1,800 jockeys engaged in thoroughbred horse racing who participated in at least one race during 1978. The fatality experience has been as follows:

Year	Deaths
1977.....	0
1978.....	4

